

THE GROWING MIND

Understanding How Your Child Learns

How Much Media
Are Kids Using?

The Magic of
Neuroplasticity

Television and Gaming
Content Matters

Social Networking
Makes Us Lonely

The Myth of
Multitasking

Read a Book,
Not a Screen

A Profile of Nicholas
Carr's *The Shallows*

CDS Talks to
Nicholas Carr



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Volume 1
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From The Editor

As you can see from the articles, this second issue of **The Growing Mind** is dedicated to the subject of technology. In particular, the magazine focuses on the various roles and effects of technology in children's lives.

There are many cautions and concerns raised throughout the magazine, because as a culture, we are only just starting to understand the ways in which technology shapes thinking and behaviour. So while there are various features of technology to celebrate – such as access to information, ease of communication, and entertainment – this current issue is not dedicated to that celebration. We feel that the delights and conveniences of technology are self-evident while the potential risks are often lost or ignored in the magnetic allure of a multimedia world.

CDS has a reputation for making careful and deliberate decisions about both programming and technology. Our first priority is the health and wellbeing – socially, emotionally and intellectually – of your children. You trust us to make the right decisions for them, and we take that act of faith seriously. Given our emphasis on research in this school, we understand that constant, uninterrupted access to various media does not offer children the opportunity to develop in an expansive and balanced way. As Nicholas Carr says in this issue, children need a refuge from technology in order to develop all of their capacities as thinkers, learners, and compassionate citizens. And so, while CDS offers students outstanding applications of technology within the academic program, it is not a laptop school. We want kids to use the right technologies at the right time and in the right places, and then we want to clear a space for them away from screens, alerts, and distractions so that they can reach their full potential.

There is constant cultural pressure to be moving inexorably toward more technology, more online resources, more screen time and newer gadgets. The School's position against the all-technology-all-the-time mentality identifies us as a bit of an outlier in the independent school system. I would say that our resistance is an act of boldness based on sound research. I hope this issue of **The Growing Mind** sheds some light on the reasons behind that determination.

As always, I hope you will get in touch to offer feedback, ask questions or make suggestions for future topics. The Department of Research and Innovation exists to serve the whole school community.

*Karen Sumner,
Director of Research and Innovation*



On the Cover

Alejandra Recio-Greenwell
Grade 10



The Country Day School

13415 Dufferin Street
King, Ontario
L7B 1K5

www.cds.on.ca

Department of Research and Innovation

Dr. Karen Sumner, Director
karen.sumner@cds.on.ca

905.833.1220 x 296

CONTRIBUTION
Warren Lang

PHOTOGRAPHY
Principal: Stan Behal
Steve McCutcheon

DESIGN & PRINT
Edward Cooper
Images Inn

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Children spend more time with media than in any other activity, with the possible exception of sleep. Looking at the evidence of their activities, we should have some questions about our children's health, balance and happiness.

How Much **Media** are **Kids** Using?

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In its 2010 report entitled *Generation M²: Media in the Lives of 8- to 18-Year-Olds*, the Kaiser Family Foundation summarizes the highly detailed information it has collected through surveys and media-use journals about young people's media behaviour. The KFF had performed similar analyses in 1999 and 2004, and so the data from 2009 – published in 2010 – offers us the ability to compare children's media use over the last ten years.

On average, young people between the ages of 8 and 18 spend more than 7.5 hours a day, seven days a week, in various media activities. As the Kaiser study puts it, “the TV shows they watch, video games they play, songs they listen to, books they read and websites they visit are an enormous part of their lives, offering a constant stream of messages about families, peers, relationships, gender roles, sex, violence, food, values, clothes, and an abundance of other topics too long to list.” Understanding the role that media play is essential for families, teachers and schools engaged in promoting the healthy development of young people.

How Much Media?

Over the past five years, there has been a huge increase in media use among youth. Five years ago, the KFF reported that young people spent an average of 6 hours and 21 minutes a day with media – and managed to pack in about 8 hours and 33 minutes worth of media content into that time through multitasking. Somehow, over the past five years, kids have managed to increase the amount of time they spend consuming media by one hour and 17 minutes, increasing the overall time to 7 hours and 38 minutes, seven days a week. In addition, because kids use more than one media form at a time, they actually pack in a total of 10 hours and 45 minutes worth of media content into those 7.5 hours, which is an increase of more than 2 hours over the past five years.

Media Use Over Time: 8- to 18-Year-Olds

Average amount of time spent with each medium in a typical day:			
	2009	2004	1999
TV Content	4:29	3:51	3:47
Music/Audio	2:31	1:44	1:48
Computer	1:29	1:02	:27
Video Games	1:13	:49	:26
Print	:38	:43	:43
Movies	:25	:25	:18
Total Media Exposure	10:45	8:33	7:29
Multitasking Proportion	29%	26%	16%
TOTAL MEDIA USE	7:38	6:21	6:19

Mobile Media

The rise in ownership of music players, cell phones and laptops is a key factor in the increase in time spent on various media. The widespread use of mobile media has allowed – even encouraged – young people to find more opportunities to access media, expanding their overall use while “on the go.”

Young people with cell phones use them less for phone conversations and more for the consumption of media: overall, they spend about half an hour talking on the phone and about an hour listening to music, playing games, and watching TV on their phones. In addition, seventh to twelfth graders spend on average 90 minutes a day text messaging – and this figure is NOT included in the total count of media use listed in the chart above.

Access to Media

While the American Academy of Pediatrics recommends *against* a child of any age having a television in the bedroom, 71% of kids have one. In addition, about half or more of them also have a video game console, cable or satellite connections, a DVD player and a CD player.

Media in the Bedroom, Over Time: 8- to 18- Year Olds

Percent with each item in their bedroom:			
	2009	2004	1999
Radio	75%	84%	86%
TV	71%	68%	65%
CD Player	68%	86%	88%
DVD or VCR Player	57%	54%	36%
Cable/Satellite TV	49%	37%	29%
Computer	36%	31%	21%
Internet Access	33%	20%	10%
Video Game Console	50%	49%	45%
Premium Channels	24%	20%	15%
TiVo/other DVR	13%	10%	~

The KFF study reveals that the rules and the environment that parents establish have profound effects on the child's access to and use of various media. Children whose parents don't put a TV in their bedroom, make an effort to keep the television turned off, and impose media-related rules spend substantially less time with media than do children with more media-lenient parents.

- Children who have a TV in their bedroom average a total daily media exposure of about 12 hours, while those without a TV in the bedroom average about 8 hours

- In homes with no media rules, children are exposed on average to almost 13 hours of media in a day, while in homes with media rules, they are exposed to about 10 hours of media

In terms of media rules, 52% of youth say they have rules about what they're allowed to do on the computer, 46% say there are rules about what they're allowed to watch on TV, and 30% say there are rules about what video games they're allowed to play. In total, 39% of children say they have some rules about media use, but say those rules aren't always enforced, and 16% say they have no rules.

Media, Grades and Happiness

Most parents have been through some argument or negotiation with their child over access to media content. Often, the child makes the case that "everyone has" what they want and/or that their happiness depends on ownership of certain media. But the reality is this: youth who spend more time with media report lower grades and lower levels of personal contentment.

The KFF grouped young people into categories of heavy, moderate and light media users: heavy users consume more than 16 hours of media content in a typical day (21% of youth); moderate users consume from 3-16 hours of content (63%); and light users consume less than 3 hours of media in a typical day (17%). Heavy media users start the day with their cell phones in hand, a television on, and video games (home or handheld) running, proceed through the average day in front of a screen or continually using their devices, and then come home to an environment where the TV is on most of the time. They sit at a computer connected to the Internet, play videogames, text on their phones, and listen to music for most of the night.

Media, Grades and Personal Contentment: 8- to 18-Year-Olds

Percent of Heavy, Moderate and Light Media Users who say they			
	Heavy Users	Moderate Users	Light Users
Get Good Grades (As and Bs)	51%	65%	66%
Get Fair/Poor Grades (Cs or below)	47%	31%	23%
Have a lot of Friends	93%	91%	91%
Get along well with their parents	84%	90%	90%
Have been happy at school this year	72%	81%	82%
Are often bored	60%	53%	48%
Get into trouble a lot	33%	21%	16%
Are often sad or unhappy	32%	23%	22%

Overall, heavy users of media show less personal contentment in their lives than moderate and light users. They tend to have lower grades, get along less well with their parents, enjoy school less, are bored more often, get into trouble more often, and are more likely to feel sad or unhappy.

Which Kids use Media the Most?

Some interesting additional information related to media use is that 11- to 14-year-olds consume more media than any other group of young people. Further, boys of all ages consume more media than girls (about 11 hours versus 10), with most of the difference coming from time spent playing console video games. On the other hand, girls devote six minutes more a day than boys to social networks and also spend more time with music and with reading print media than do boys.

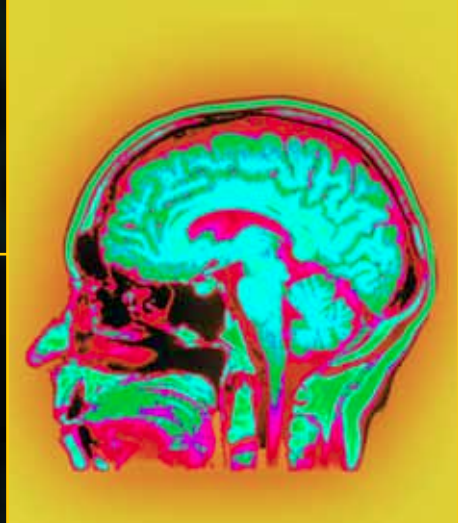
What Does it All Mean?

We know that brains are "plastic" and that their cellular organization is partly determined by environment and experience (see "Essential Vocabulary: Neuroplasticity"). Neural pathways are laid down and reinforced when we repeat activities. So what happens in the brain – and what happens to thinking, learning, and behaviour – when young people spend a great deal of time in media activities? This is a pressing question for many neuroscientists, cognitive psychologists, educators and parents who share the goal of building healthy minds.

At the least, it would be interesting for families to conduct their own studies of what happens in the house on an average day: how many devices are on, for how long, and who is using them.

It may also be worthwhile to put some technology limits in place if there aren't some at present and to talk to kids about what the limits can achieve: more time together as a family engaged in real activities and less time in relationships with devices. 🌱

Essential Vocabulary: NEUROPLASTICITY



The development of the brain's abilities, what is usually called "intelligence," is not entirely determined by a person's genes. The way that the brain wires itself and then modifies and tunes its synaptic connections and neural pathways is influenced by environmental factors. This openness to change gives the brain its *plasticity*, a term that refers to the brain's ability to add or remove connections based on learning and experience and thus actually change both its physical structure and functional organization.

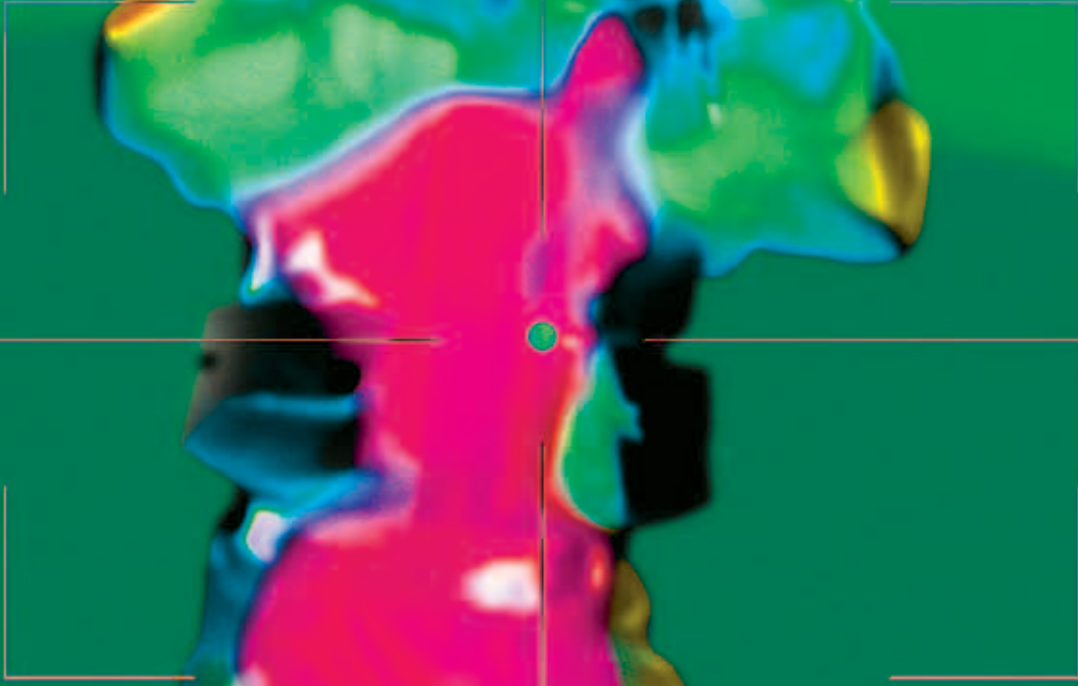
Scientists used to believe that the only change possible in the brain was decline – brain cells are injured or die as we age and are not replaced. It was also believed that the brain could not alter its structure or find a new way to function if a part of it was damaged.

Today, it is widely accepted that the brain is changeable, malleable, modifiable – "plastic." We are learning that damaged brains can reorganize themselves and that many "circuits" that we think are hardwired are not. By engaging in thinking and activity, we can actually change the structure of our brains. And this is especially true of children, whose brains are developing rapidly in the first 20 years of life. The world they are exposed to, the activities they engage in, and their relationship with technology build neuro pathways and design their brains.

Studies show that children exposed to sexual and violent content on television and in video games are more likely to initiate early sexual behaviour and to show aggression in school and at home.

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TELEVISION AND GAMING

Content Matters

In a given week, children spend on average about nine hours playing video games and an astonishing thirty-one hours exposed to television content. This high level of exposure to these media raises some questions about what children are watching and how they may be affected by the content of their activities.

There is a body of research available to answer these questions. As compared to children who have limited access to media, children exposed to sexual content on television are more likely to initiate sexual activity at a younger age. In addition, children exposed to television violence or who play violent video games – in either “silly” cartoon or more graphic, realistic forms – show more aggressive and hostile behaviours as a result.

Media Violence and Behaviour

Numerous well-established studies have found “unequivocal evidence that media violence increases the likelihood of aggressive and violent behaviour in both immediate and long-term contexts.” Exposure to violent television and videogames results in what researchers call the rehearsal and learning of aggressive scripts, aggressive beliefs, and aggressive “expectation schemata,” which means the assumption that the world is a hostile place that requires an aggressive response.

In other words, children partly learn the “script” of how to conduct their lives, and particularly how to act if they feel scared or threatened, through the media they use. If they see aggressive and violent responses in the fictional worlds, they develop scripted responses based on what they have learned. When the exposure to violent television and videogames decreases, so does the physical and verbal aggression children show, both at home and at school.

Videogames are considered by many researchers to have more immediate and dramatic effects on behaviour than television. This is because of the interactive nature of the games and the direct rewards that players experience when choosing violent solutions to problems. Players often earn points and are considered “successful” when they choose violent solutions. As a result, children feel rewarded when engaging in these activities in their real lives.

Sexual Content on Television

Given the high percentage of youth who have televisions in the bedroom, and their overall level of exposure to television (4.5 hours per day), it is worth considering some of the content of what 8- to 18-year-olds are watching. In addition to acts of violence and aggression similar to those in some videogames, sexual content is customary on television shows. In a 2005 study of television shows marketed to tweens and teens, the Kaiser Family Foundation provides the following information:

- 70% of television shows offer sexual content, ranging from talking about sexual issues to the full array of sexual behaviours
- On prime-time and major broadcast networks, the number of shows offering sexual content climbs to 77%
- Only 10% of television shows with sexual content include consideration or discussion of the risks or responsibilities of sexual behaviour
- By comparison, in 1998 56% of television shows offered sexual content

Young people’s access to representations of sexuality has increased over the past five years, and, in media studies, both parents and teens agree that sexual content on TV influences the behaviour of young people. In fact, three-quarters of teens say that what they see on television influences the way that they act.

Limiting Access to Games and Television

A study published in *Pediatrics* confirms what young people themselves say: “watching sex on TV predicts and may hasten adolescent sexual initiation.” This study and others also show that interventions to reduce access to television and videogames are successful in decreasing both aggressive and sexualized behaviours. Parents can use rules and controls to lessen the negative impact of these media in their children’s lives. 🏠

One of Turkle's conclusions is that many of us are "insecure in our relationships and anxious about intimacy." This is partly a consequence of having been raised among gadgets and technologies that offer electronic rewards, affirmation and even affection. As a result of not feeling secure in the love of others, we seek ways to be in relationships *and* to protect ourselves from intimacy at the same time. Social networking allows us to have "friends" and "friendships" that require very little real-life intimacy and emotional risk. It distances us from our feelings as it connects us to others online. As a consequence, says Turkle, "we expect more from technology and less from each other."

Turkle also studies the ways in which online identities can bring out the worst in us. In looking at teenage use of Facebook and other social networking sites, she has ample evidence of teens behaving in socially irresponsible ways. Says one sixteen-year-old girl who gives herself "permission to say mean things" online, "you don't have to say it to a person. You don't have to see their reaction or anything, and it's like you're talking to a computer screen so you don't see how you're hurting them. You can say whatever you want, because you're home and they can't do anything."

Social anxiety and fear over being left out have also increased in young people's lives as their access to technology has increased. As Turkle puts it, "anxiety is part of the new connectivity." Teens are afraid to turn off their social sites in case they are excluded from some online social activity.

Further, as their cell phones follow them everywhere, young people do not learn how to be independent and develop the inner resources needed to navigate issues and distances on their own. Parents and kids generally like to be connected to each other, but that continuous contact can have a price: the absence of developing autonomy in a child, the lack of confidence in being able to take care of oneself, and a fear of being alone.

Other researchers have noted the "Internet paradox" that Turkle describes. One study published in *American Psychologist* found that greater use of the Internet for social communication is associated with declines in live



communication with family members, declines in the size of a person's social circle, and increases in depression and loneliness.

The theme running through these studies is that technology both shields us from our anxieties and amplifies them. We may even conclude that *because* technologies shield us, we become *more* fearful and anxious in real life situations. We feel we have less to risk emotionally when we are online, but at the same time we struggle more with the hard emotions of our daily lives. The upshot is that social and emotional anxiety can develop as a *result* of using social media, as can an increasing sense of loneliness even though we "connect" online.

No parent wants their child to suffer as a result of online social activities. But surveys indicate that most parents don't really know what their kids are doing online. And the catch is, even if those online activities are positive and friendly, children can *still* end up feeling anxious about their social status and about how accepted they are in their social groups.

Because the developing mind of a child is complex, it is difficult to see the relationship between online activities and the *emotional self* that is under construction. It may be wise to delay the use of online social media for as long as possible, to curb its use when permitted, and to help kids to fully develop their real-world social selves. 🏡



Do your kids say they can do homework, send text messages, update Facebook and watch TV at the same time? They can't. Their brains – like yours – can only do one thing at a time.

The Myth of

multitasking



There are some activities we can do two or three at a time: cook dinner and listen to music, iron shirts and talk on the phone, nurse the baby and read a book. But when it comes to mental activities that require focus or thought, we humans are only capable of “serial attention.” This means that we can only focus our minds on one activity at a time. When *mental attentiveness* is required, we are actually “singletaskers,” not multitaskers, and there is no changing the way our brains are fundamentally structured.

Often, adults and children perceive themselves to be capable multitaskers, especially when managing various digital environments, but the research tells us otherwise: multitaskers are invariably less competent, less efficient, less accurate, less able to manage complexity, and less able to recall the content of what they have been doing compared to individuals who focus on one task at a time. Dividing the brain’s attention between two or more mental tasks exacts costs in both performance and time.

Multitasking is actually rapidly switching from one task to another rather than simultaneously performing two mental tasks. While we may be able to walk and talk at the same time, we cannot recite an epic poem and complete a crossword puzzle at the same time. And every time our children shift their attention – from homework to Facebook to the television screen to the BBM thread and back to the calculus problems – the time it takes to complete a single task increases and the level of performance decreases. Students who multitask as they do homework produce inferior work in terms of both comprehension and accuracy.

Further, their tendency to rapidly toggle between several tasks undermines the development of a child’s ability to focus and pay attention for extended periods of time. The more kids juggle their mental time, the less able they are to stay still and concentrate when extended mental effort is required: reading a book, composing a research paper, writing tests and exams. A 2010 study of reading and college readiness reveals that almost a third of students who attend a four-year college program in the U.S. show an inability to understand complex texts. This failure has been traced back to two potential sources: one, a poor quality of reading materials at the high school level – materials that simplify, summarize, generalize, and are not intellectually challenging – and two, a diminished capacity for today’s students to engage in the slow, linear reading that complex texts require.

Complex texts require singletasking, as Emory University Professor of English Mark Bauerlein puts it: the capacity for uninterrupted thinking. He adds, schools should “preserve a crucial place for unwired, unplugged and unconnected

learning. One hour a day of slow reading with print matter, an occasional research assignment completed without Google – any such practices that slow down and intensify the reading of complex texts. The more high school teachers place complex texts on the syllabus and concoct slow, deliberate reading exercises for students to complete, the more they will inculcate the habit.”

Slow, deliberate reading is the antithesis of the fragmented multitasking that most students engage in on a daily – and nightly – basis. One of the strong draws is that multitasking feels good: the mind craves the “high” of continuous, excessive stimulation. And, as Sherry Turkle has discovered in her technology studies, “the high deceives multitaskers into thinking they are being especially productive. In search of the high, they want to do even more.”

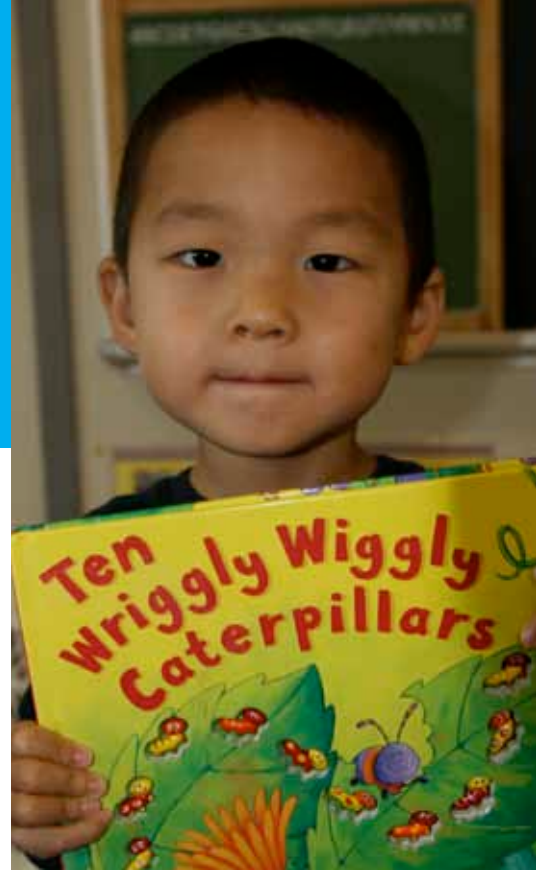
But they don’t perform well on any of the tasks they are attempting. And this illusion of competence worries scholars who study attention and learning. Heavy multitaskers are often extremely confident in their abilities but perform much worse on thinking and memory tasks than do singletaskers. They have difficulty assessing the quality of their work accurately and seeing the connection between poor work and a distracted state of mind.

Martha Bridge Denlicka, a neuroscientist at Johns Hopkins who studies attention, has seen a connection between what students have access to in their bedrooms and how well they learn: “children’s rooms are now almost pathogenic because they have so many distractions. I think the most devastating thing that has happened [to children’s attention] is giving a child a room with a computer in it – you think you’re being a good parent by doing so. Well, a funny thing can happen on the way to the homework.” By “pathogenic,” Denlicka means contributing toward a mental disorder – in this case, the brain’s inability to sustain the attention required for deep and lasting learning.

Children’s learning routines have a tremendous impact on their brain development. Until a person is well into their 20s, the regions of the brain that manage judgment, self-control and emotional regulation are still under construction. And during this first twenty years, the brain is highly adaptable to and influenced by external environmental circumstances. As Jordan Grafman, Chief of Cognitive Neuroscience at the National Institute of Neurological Disorders and Stroke points out, the dominant learning routine is going to play an enormous role in how kids’ brains develop and what kinds of learning strategies they store. If they are constantly toggling between homework, instant messaging and online videos, they may get really good at toggling. But that does not equate to being good at deep and sustained learning. 🌱

In *The Shallows*, Nicholas Carr examines the role of print and reading in the development of human thought. Here is a summary of what the author says about the differences between reading computer screens and reading paper.

Read a Book, NOT A SCREEN



Divide a group of readers in two. Give half of them something to read on a computer screen, with links at the bottom of the screen to get from page to page. Give the other half a paper copy of the same reading material. Then, test both groups after they are finished reading on what they understand and what they remember, and the results of their efforts are consistent: those who read screens have both a *diminished understanding* and a *diminished memory* of what they read compared to the paper-reading group.

This experiment has been conducted using short stories as the reading content. Some people are given a “hypertext” version of the story to read, on a computer screen with links to click as on any Web page, and some are given the story to read on paper. The hypertext screen-readers take longer to read the story and report more confusion and uncertainty about what they have read. In tests that follow, they have more difficulty understanding and remembering what they have read than the paper people.

Here’s why: working memory – our temporary in-the-moment memory, the one we use to hold onto a new phone number long enough to dial it – can only hold a very small amount of information at a time. And working memory can be quickly exhausted or maxed out when we use technology. When this happens, we fail to hold onto information long enough to transfer it into long-term memory. The depth of our intelligence does not come from working memory, though we need it at every moment. Our intelligence is a matter of what we have in our permanent memory and what we can do with it once we have it stored there.

The passage from working memory to long-term memory is like a bottleneck in our brain. We can take in and transfer

into long-term memory a *slow trickle* of information. When we read a book, the information faucet provides a steady drip, which we can control by the pace of our reading. The text on the page provides a single kind of sensory input – words – and comes to us a bit at a time. This means that we can transfer all or most of what we read on paper into long-term memory as we go along.

On the contrary, Web pages provide several faucets at once, most of them going at full blast. There are banners, tables of contents, advertisements, moving images and sounds, plus the need to scroll, click, and interact with the physical keyboard of our devices. Our thimble-sized working memory overflows very quickly, and so much of what we are seeing in that crowded multi-sensory landscape spills out of our working memory rather than getting transferred into long-term memory. This is one reason why we can spend – or lose – a few hours on the Internet and not really be able to account for what we were doing. Time gets lost. So does a lot of the content.

There are basically two things the Internet demands that cause “cognitive overload,” which leads to the failure to retain information in our memories. One is problem-solving and the other is divided attention.

In order to use the Internet, we have to constantly make all kinds of decisions: where to place our eyes on a page given so much competing material, where to place our hands in order to click or scroll, how to evaluate links, and how to navigate a path from one page to another. It turns out that these are demanding problem-solving tasks that are unrelated to the act of reading. So when reading a Web page, our attention is directed toward the *machinery* of the

technology rather than toward the *content* of the text. The *medium* – the multi-sensory screen with all of its motions and options – obscures the *meaning* of the words.

Having to make continuous decisions about the material in front of us leads to a state of divided attention: we are not only focused on the content before our eyes but also on how to manage the content.

When hypertext was developed, it was hypothesized that people who used links to follow their own reading paths would gain a richer understanding of the material presented. This turns out to be wrong: readers who click links to get from one page to another score lower on comprehension tests than those who read paper. The links get in the way of learning, the researchers concluded. They immerse us in problem-solving activities and they pull our attention in many directions at once. And the more links there are, the more comprehension declines.

Here is the conclusion drawn from studies of screen reading: “the increased demands of decision-making and visual processing in hypertext impair reading performance.”

In addition, other studies have found that hardly anyone reads online text in a methodical, line-by-line way, as they would read a page in a book. Eye-scanners reveal that online readers skip and skim text, their eyes moving down the page in a pattern that resembles the letter F: glance across at the top, scan down the side, glance across again, scan down, done. Many eye-tracking studies have confirmed this pattern. Reading has been replaced by skimming, skipping, and scanning. One researcher summarized the findings: “How do users read on the Web? They don’t.”

What are parents to take away from all this? And schools? At least that, when it comes to reading, the screen is not a substitute for paper. We do not interact with it in the same way. Screen reading impairs depth of understanding and thought. And it may in fact – as a highly distracting medium – be making it difficult to focus and concentrate at other times when deep reading and thinking are required. 🌊



The Shallows: What the Internet is Doing to Our Brains

In *The Shallows*, Nicolas Carr argues that the growing dominance of the Internet in our lives is literally rewiring our brains and eroding our ability to read, think and focus our attention.



In discussing the role that technology plays in our lives, Canadian media scholar Marshall McLuhan famously declared that “the medium is the message.” McLuhan meant that the *information* or the *content* that a medium delivers – such as sound coming over the radio, or images on a television screen – matters less than

the medium itself in influencing how we think and act. In the early pages of *The Shallows*, Nicholas Carr takes up McLuhan’s message that technologies mold what we see, how we see it and, eventually, who we are as individuals and as a society. Carr asserts that media “work their magic, or their mischief, on the nervous system itself.”

Carr looks at the role of technology in our lives through the lens of neuroplasticity – the well-established notion that our neural pathways, the connections we build inside our brains, are constantly developing, changing and rearranging in relation to our experiences. He says that we tend not to consider how technology shapes our brains:

We’re too busy being dazzled or disturbed by the programming to notice what’s going on inside our heads. In the end, we come to pretend that the technology itself doesn’t matter. It’s how we use it that matters, we tell ourselves. The implication, comforting in its hubris, is that we’re in control. The technology is just a tool, inert until we pick it up and inert again once we set it aside.

Carr’s point is that technology is *not* inert, either when we actively use it or when we temporarily set it aside. He argues that McLuhan’s point about the medium mattering more than the message applies with even greater force to



the Internet: “the computer screen bulldozes our doubts with its bounties and conveniences. It is so much our servant that it would seem churlish to notice that it is also our master.” Carr emphasizes that media aren’t just channels of information. They supply the stuff of thought, but they also shape the process of thought.

At the core of Carr’s book lies a comprehensive argument about the role of the Internet in shaping the human mind. He looks at the evidence – what psychologists, neurobiologists, educators and Web designers have disclosed in various studies – and concludes that, with the exception of the alphabet and number system, the Internet may be the most powerful mind-altering technology that has ever come into general use. Some of his central ideas:

- When we go online, we enter an environment that promotes cursory reading, hurried and distracted thinking, and superficial learning.
- The Internet delivers precisely the kind of sensory and cognitive stimuli – repetitive, intensive, interactive, addictive – that have been shown to result in strong and rapid alterations in brain circuits and functions.
- The Net engages most of our senses simultaneously, and provides a high-speed system for delivering responses and rewards which encourage the repetition of both physical and mental actions.
- The Net seizes our attention only to scatter it: we focus intensively on the medium itself, on the flickering



screen, but we're distracted by the medium's rapid-fire delivery of competing messages and stimuli.

- The Net's multisensory stimulation – motion, sound, text, image, scrolling, pop-ups, links, and so on – prevents our minds from thinking either deeply or creatively.

One of Carr's fundamental arguments is that the Internet and other screen technologies inhibit, rather than enhance, our ability to learn. This is an especially important point for educators and parents to heed. There is a general assumption out there that digital technologies, virtual textbooks, e-readers, and online educational materials help kids to learn more, but the research does not support this assumption. The assumption may exist because we enjoy technologies – our smartphones, our laptops, our access to the Web – but not because we *know* they enhance learning.

That the Internet improves learning for children is an assumption based on a wish, says Carr, and not a proven reality. It is also an assumption that the Internet and profit-driven providers of educational materials present to users all the time. Carr would have us adopt a skeptical and questioning response to what the Net is selling.

Carr does not accept what many educators assume because research does not support it. It is not the case that "rich media" or multisensory learning deepen comprehension and understanding by providing more sensory inputs. The stress that the inputs place on our working memory and the division of attention demanded by multimedia texts diminishes our learning and weakens our understanding.

There's a lot of pop and sizzle on the Net but often very little to hang onto after the fact. Says Carr, "the Internet wasn't built by educators to optimize learning. It presents information not in a carefully balanced way, but as a concentration-fragmenting mishmash."

The Net is an "interruption system, a machine geared for dividing attention." And psychological research has long proved what most of us know from experience: frequent interruptions scatter our thoughts, weaken our memory, and make us tense and anxious.

What the Net does well is highly evident to all of us, and high-speed access to information (reliable or otherwise) can be a great benefit. In addition, some lower-level mental functions such as hand-eye coordination, reflex response and the processing of visual cues can be strengthened through computer use. Veteran videogame players can identify more items in their visual field than can novices. And there is some improvement in the speed at which we can shift from task to task. There is some "exercise" that the brain receives online. And, fundamentally, no-one is willing to give up the Internet. It is here, attractive in its many features and genuinely helpful in some of them.

But the benefits come at a price. One odd but well-supported outcome of using the Internet is that we actually *feel* like it makes us smarter: we have sensations of purpose, mastery and accomplishment while speedily navigating through and accessing all of its options. And the feelings, Carr explains, can be intoxicating. They are also misleading. Studies show, for example, that people who text and drive believe that they are highly competent multitaskers. They feel powerful and in control. But the reality is that their skills are greatly diminished and that combining texting and driving is dangerous. But the *feeling* of using technology is often one of mastery, and people tend to take the feeling for reality.

Carr points out that the Internet is making us smarter only if we define intelligence by the Net's own standards: fast, fragmented, distracted, and able to hop from task to task and sensory experience to sensory experience. If we look at intelligence as depth of thought, however, we "have to come to a different and considerably darker conclusion."

Carr is asking us to think carefully about both the bounty and the blemishes of the Internet and be aware of its dangers. The case for its benefits is made every day: the Net grants us instant access to a library of information unprecedented in its size and scope, and it makes it easy for us to sort through that library. But it can also undermine key skills and a primary kind of knowledge: the ability to focus, remember, achieve clarity of thought, and know things in depth. 🍷



Schools can be a place of refuge from technological distractions and interruptions.

Nicholas Carr



The author of “Is Google making Us Stupid?” and *The Shallows* talks about the ways in which technology can undermine our ability to think deeply, understand what we read, and pay attention to what matters.

CDS: Can you talk about why you decided to write *The Shallows*?

NC: The inspiration for the book was very much my own personal experience. A few years ago, after having been an eager user of personal computers and other gadgets, and obviously the Internet and the amazing things that come through it, I realized that I was having trouble concentrating. I particularly realized that when I sat down with a book and tried to concentrate on the text for a long period of time – a book or an article (as a person who has a literary side, that is something that used to come naturally to me) – I realized I was struggling with reading – deep, extended reading. And as I thought about it, my first instinct was that it had something to do with age, getting older. But I realized that my mind really literally wanted to behave the way that it behaves when I am using a computer, when I am online. It didn’t want to stay on one extended linear story or argument; it wanted to jump around, seek other input, check messages, and all that stuff.

So making that connection between the difficulty concentrating and reading and my technology and Web habits led me to look down two paths of research: one was some of the new science of the brain, and whether and how the brain is influenced by the new technologies we use to find information, communicate and learn – what I call in the book “intellectual technologies.” And the second path was back in time, to see if earlier technologies of that sort exerted an influence over the way people thought. And so it was those two strands of research that I tried to weave together for the book.

CDS: Plus you have woven in some media studies, and particularly the work of Marshall McLuhan.

Right. Because it became pretty clear early on that the technologies we use, the media we use to find information, to read, and to share information influence the way that we think in a deep way. Marshall McLuhan’s adage that “the

medium is the message,” which we kind of repeat all the time today without understanding it, actually carries even more weight today than when he wrote it back in the early 60s. It’s amazing how rich the writing in media studies was in the last century and how today there is less adventurous thinking about media at a time when we might need it most.

CDS: What questions do you think schools need to ask, or what processes do you think should be in place, when considering the adoption of any technology?

NC: The first thing that I think that educators and parents should keep in mind is that we tend to idealize technologies, and, particularly, we tend to idealize how kids will use technologies for learning and for school. And with the introduction of personal computers in schools, it is very easy to come up with this idealized picture and focus on a narrow view of technology’s role. The idea that kids should have computers in school is based on this very well-meaning assumption that they will sit down at a computer and use it for homework and for research and to deeply understand different perspectives.

But what kids do with computers is mainly communicate with other kids, have fun, play games, and entertain themselves. And there’s nothing wrong with that. But the problem comes when, through the multitasking nature of modern computers and cell phones, there is constant distraction. There are often all kinds of social conversations – instant messaging, Facebook, and so on – occurring simultaneously with doing homework. And so what ends up happening is that we create a learning environment where kids are constantly interrupted and constantly distracted, and they never really have a chance to focus deeply and concentrate deeply.

Some recent studies of technology show that when a computer appears at home for a child to use, their test scores tend to go down rather than up. And the researchers

hypothesize that this is because of the distraction factor. And it's similar with cell phones. A lot of parents buy young kids cell phones with very good intentions: if they're in trouble, they can reach out and contact their parents quickly. But what you quickly realize is that kids use it to text all day long, and sometimes when you call them, they're not even going to answer. And again, that's the reality. We have an idealized view of how technology will be used.



CDS: Which may contradict the truths of who we are, what habits we form, what desires drive each of us....

NC: Exactly. And so the first step is not to take an overly idealized view. Look at the possible benefits, yes, but look at how kids really use these things and particularly how distractions and interruptions can break their train of thought and break their concentration.

CDS: What else should schools consider?

NC: A second thing—and this isn't anything new in educational research—is to think about the concept of "cognitive load." Our short-term memory has a very limited capacity, and when you push too much information too quickly, especially at a child, very little of it sticks. The information quickly overloads their short-term working memory and they don't comprehend as well, they don't learn as well. This is well established in research. And the basic message there is that when it comes to providing information in a learning environment, more is not necessarily better. In fact, more can be worse. Because the deepest learning comes when people pay attention. And so the second consideration is to look at how technologies influence concentration and attention.

It seems to me that when you start thinking in those terms, you suddenly see that the same content supplied through a computer screen has a very different effect than when supplied on a printed page, because the fundamental quality of a printed page—a book, a magazine article—is that it shields the reader from distraction. A book is not a multimedia device, there's nothing else going on: it's just the words. And so as a medium, it encourages engagement, attentiveness and concentration. A computer screen, whether it's a cell phone or a PC or an e-reader, actually inundates us with distractions and interruptions, because it is a multitasking, multimedia device. So those screens have almost the opposite effect than a printed book does.

If we assume that the content is taken in and understood in the same way, regardless of the medium, we're being naïve. And we're ignoring the important effect that the technology itself has on understanding and learning. And so the very technology that represents itself as being able to deepen learning, deepen understanding, increase access to ideas and improve the quality of our thinking is undermining learning, understanding and thinking.

CDS: The irony is kind of staggering. And for kids who have difficulty maintaining attention, the solution people often reach for is to give them more of the things that are eroding attention, more of the technologies that are contributing to a high level of distractibility. So we're sometimes sending kids toward the media rather than focusing on developing the attention that is lacking, developing the ability to attend?

NC: Yes, exactly. And that is one of the paradoxes of the computer screen: it can consume your attention while also shattering your attention. And so what looks like attentiveness is really constant shifts in focus and surface skimming and not attentiveness at all, except at a very low level.

CDS: I recently attended an academic conference that was focused on technology, and I heard there that we have a moral obligation to "meet kids where they are." Participants were arguing for increasing the use of technology in classrooms—cell phones, clickers, interactive Web-based textbooks, and so on—because that's what kids are doing, that's what they connect to, that's their world. And I was perplexed by the moral foundation of that argument. The assertion that we ought to give children access to the digital technologies that they enjoy because they enjoy them is not a moral argument. As with adults, their choices and their desires are not always healthy.

NC: There is a tension between the idea of a school as a place that is tuned into current technology and current behaviour of kids and molds itself to that technological environment versus the view of a school as a refuge from that environment. And I think it has to be both. You don't want to entirely shield kids from the technologies they ought to learn how to use and will need when they are older. There are pedagogical uses for computers that provide benefits

you can't get without them. But on the other hand, I think it's imperative that a school also be a place where kids can disconnect from the constant stream of information and distractions and interruptions and be a place of refuge.

CDS: It can be quite a battle to keep some of the technology at bay, or to have it used only at certain times and to maintain a refuge, as you say, at other times.

NC: I can certainly understand the struggle that some schools are having to be moderate in their approach to technology. But the more we understand the possible negative effects of technology on children, the more we can understand that there is a time for technology and there is a time to be removed from it. Those two different modes encourage different ways of thinking, different ways of learning, and both are important in raising well-rounded, thoughtful individuals. And both can't happen if students have constant access to screen technologies.

CDS: So if there is a moral obligation here, you are suggesting that it may be to offer students another kind of learning environment, an alternative to the endless screen time.

NC: Yes, and so one of my intents in writing *The Shallows* was to provide some evidence and research into the effects of multimedia and multitasking environments – the negative effects on comprehension, learning, critical and conceptual thinking. The more we familiarize ourselves with the research on attentiveness and disruptions, the more we realize that if we don't teach kids how to pay attention, they are going to lose the capacity. Aside from the practical impact on developing job skills, for instance, they are also going to lose the richness of thought that only comes when we are able to tune things out and pay attention.

CDS: Can you comment on the use of online textbook resources and e-books? Some schools are going down the road of reducing the print materials student use and increasing the online materials, and they are assuming that this is a good thing for kids and for learning.

NC: Yes, and I think this is unfortunate. There are practical, economic reasons that will make the shift to e-textbooks very easy for some people, very fast. And that's unfortunate because I think that, as a medium, print encourages a kind of single-minded attentiveness and engagement with stories and ideas that you don't get with multifunctional computers. At the least, if online resources are going to be used, it would help to turn off some of the multifunctionality of the technology itself. It's not great for kids to have five screens open at the same time. But I imagine that most schools will move toward online resources.

And as e-books become more and more common at home, then you run into the situation where print starts to feel old-fashioned to a parent, even if a school has good pedagogical reasons to use it.

CDS: You talk a lot about neuroplasticity in your book. Can you talk to us a bit about kids' brains and plasticity, about the neurological consequences of exposure to technology for children in particular?

NC: In terms of the neuroscience, the great discovery in recent years is that even adults' brains are constantly changing, constantly adapting. But that doesn't change the fact that it's in the first 20 years of life that a lot of the basic wiring, a lot of the basic neuropathways, are laid. And it's in that time that the brain is very good at pruning out what isn't getting used and putting more cognitive resources behind what is getting used. In other words, the habits of learning and thinking that are developed as a young person have lifelong implications. In those years, you are not just learning stuff but learning how to learn, and your brain adapts to that.

There's both good news and bad news there. Kids can shift between lots of different activities and ways of thinking and also sit down with a book for hours on end. The important thing is to realize that if you encourage both ways of engaging with information – both the deeply attentive way and the fast-paced shifting way – kids will develop the brain pathways required to do both things. But if you push kids from a young age to constantly multitask, to use a lot of screen-based technologies, then the danger is that their brains will become optimized for being distracted. And they'll struggle, and possibly fail, to build the strong cognitive capacity for paying attention and get all the benefits of paying attention. So the important thing, I think, is to make sure that kids learn in different ways to develop the wiring that gives them the flexibility to pay attention when needed and shift attention when needed.

But I fear that we're moving the emphasis in the educational environment away from attentiveness. We do need to keep in mind that the way we learn when we're young has a profound influence on how our brains work when we are older.



CDS: You also make a connection in your book between the use of social media among children and teens and increased social anxiety.

NC: What makes things even more intense for kids than for adults is the social nature of so much of the technology they use. As we all know, kids are highly attuned to social messages and don't want to feel like they are isolated and not hearing what their friends are talking about, and so the social pressure to be constantly connected becomes extreme for kids, in a way that is beyond, I think, even what adults feel. It is very, very hard for kids to back away from that stream of social information because they then feel socially isolated, and that is a very difficult emotional state for a child. But those social media can erode attention as well as contribute to social anxieties in children, who worry constantly that they might be missing something if they are away from their devices.

At a college in Maryland, there was an experiment where students shut off their technologies for a period of time, and the language they used to describe the sensation, words like "amputation," was extraordinary. And that was only for a week!

One of the big question marks as we move forward is what it means to be constantly socializing and not to have those times when you are alone with your thoughts, have some solitude, deal with boredom, amuse yourself.

CDS: We've been talking for awhile, and I know you have a busy day ahead. Any final words of advice to CDS parents?

NC: One of the overarching themes of my work is that paying attention is not a quality that comes naturally to people. It has to be taught. And there are all sorts of great intellectual discoveries and roads of thinking that only come when we can maintain attention and tune out distraction. So the more that parents and teachers can understand the importance of learning to pay attention, learning to filter out distractions, the more skeptical they will be about the value of technology and the more critically they will think about the ways that technologies shape children's minds.

CDS: I really appreciate your time, Nick. I'll let you get back to your Colorado mountain range now....

NC: Thanks for calling, Karen. 🏡

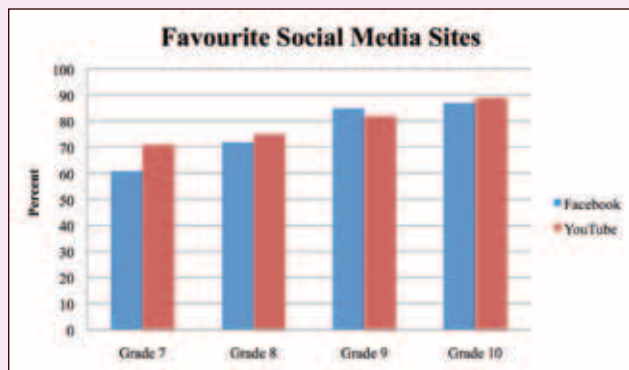
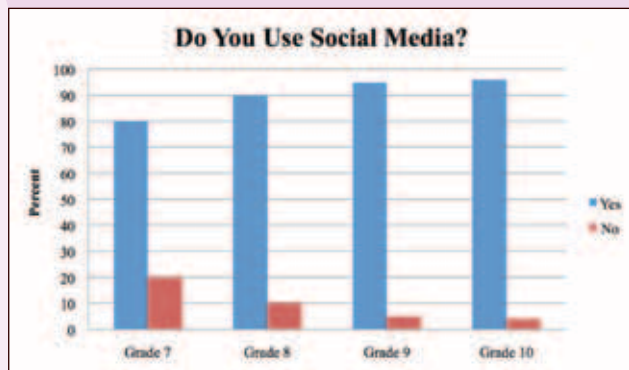


CDS Social Media Survey

Here at CDS, we ran a brief survey of grade 7 - 10 students to learn about their use of social media. By “social media,” we mean Internet sites that students use for social interaction. The survey did not ask about the use of email or text messages.

The results of the survey are in the charts below. A few summary points:

- Either students are less interested in social media in Middle School or their parents are more restrictive, but by grade 10, 96% of CDS students are socializing online.
- Not surprisingly, Facebook and YouTube emerged as the most popular online social “meeting” sites for chatting and sharing photos, songs, and videos.
- In terms of time spent using social media, the increase from grade 7 to 10 is dramatic: approximately 70% of grade 10 students spend more than four hours a week on social media sites, and almost a quarter of the grade 10 class spends over 8 hours per week socializing online. 📱



“Social media is great for interacting with friends far away, but it can harm you if you are getting cyber-bullied.”
– Grade 7

“I spend too much time on Facebook and I find it distracting.”
– Grade 7

“I don’t use Facebook or Twitter etc. because I know that it is very dangerous and I don’t want people knowing who I am and what I look like and how old I am.” – Grade 7

“It’s fun to talk to your friends but there are some creepy people who hack your account and your personal information.” – Grade 8

“It makes you stupid.” – Grade 8

“It’s great to keep in touch with family who are far away.”
– Grade 8

“It’s a great way to chat with friends.” – Grade 9

“It’s not worth my time or energy.” – Grade 9

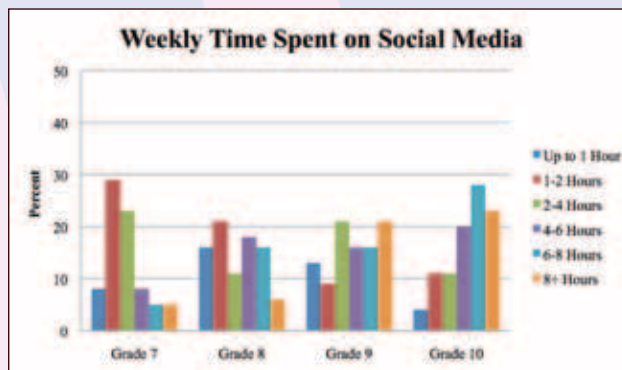
“It distracts me from my homework.” – Grade 9

“I get addicted to these things.” – Grade 10

“It consumes so much time in your life.” – Grade 10

“It keeps me from being bored and lonely.” – Grade 10

“People say a lot of hurtful things.” – Grade 10



RESOURCES

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13415 Dufferin Street
King, ON L7B 1K5
905.833.1220
www.cds.on.ca

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